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THE MISSOURI: A GREAT RIVER BASIN OF THE UNITED STATES. ITS RESOURCES AND HOW WE ARE USING THEM

Missouri Basin Interagency Committee

1958

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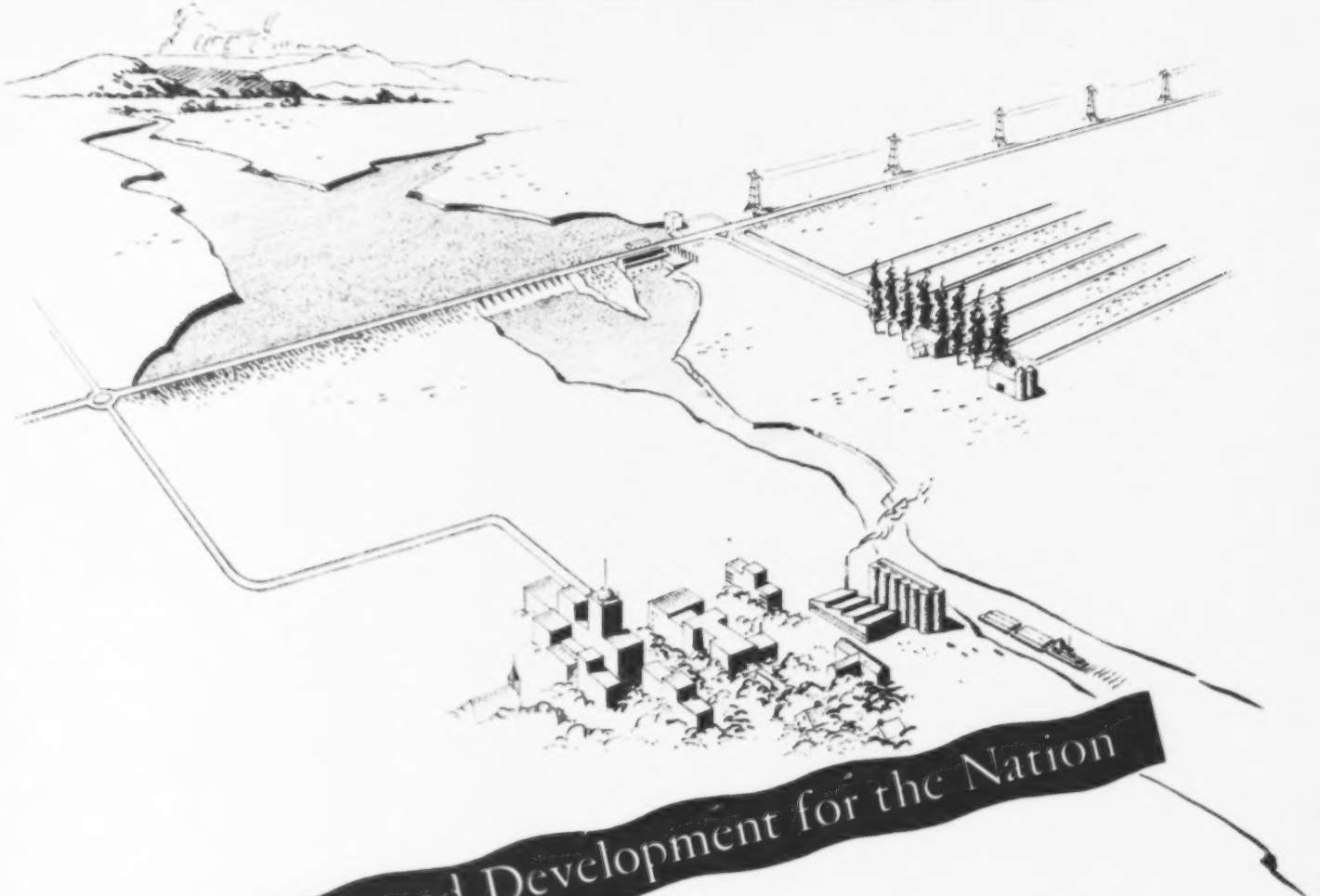
The Missouri



Water and Land Development for the Nation

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MISSOURI BASIN INTERAGENCY COMMITTEE

This report is a tale of a great peaceful constructive undertaking—freely assumed by the people of this country.

It is a tale, briefly told, of our national effort to develop the vast resources of *one-sixth the area of our country*—the Missouri River basin, greatest in the United States and one of the greatest in the world.

The goal: Transformation—of a drought-plagued, flood-ridden land, periodically overgrazed and overplowed; a valley rich in resources yet underpopulated, underindustrialized and economically unstable—to a land of greater economic security and strength contributing its full share to the American welfare.

No man or group of men, no city, county or State, no Federal agency, working alone, could hope to cope with the magnitude and complexity of properly developing this immense and diverse area.

Piecemeal development had been going on for years. But the region as a whole lagged behind the rest of the country. In 1944 Congress authorized the Missouri River basin development program.

As a result, today, development of the basin's water and soil resources is a coordinated activity covering the entire area—on a scale heretofore unknown—and commensurate with the need.

How the plan works, its results to date and future objectives are related in this booklet.

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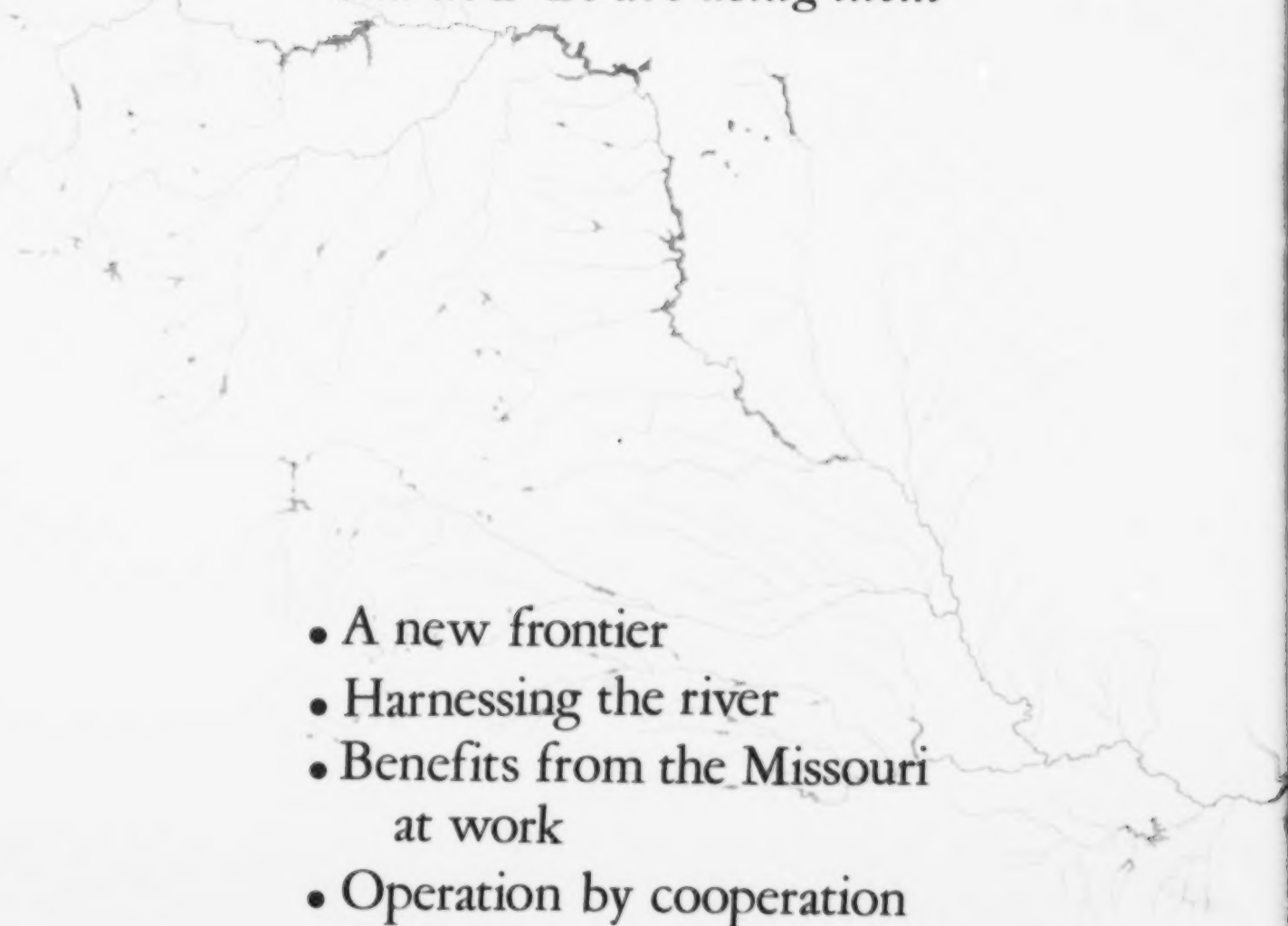
The Missouri

A great river basin of the United States

Its resources
and how we are using them



- A new frontier
- Harnessing the river
- Benefits from the Missouri at work
- Operation by cooperation
- Water controls the future

Details of illustrations in this document may be better studied on microfiche.

A new

DOMINANT FEATURE of the great Missouri basin—half a million square miles in extent, stretching from the Mississippi to the Rockies and mid-Kansas to Canada—is the Missouri River.

In the early days the river gave life to this seemingly endless expanse of land, largely rolling prairies and treeless plains. Its water made living possible for the buffalo . . . Indians . . . white men that came . . . one by one, then hundreds . . . thousands.

Marquette and Joliet; Pierre Gaultier and his sons; Lewis and Clark; trappers for beaver, hunters for buffalo, traders, gold miners, Indian fighters, gamblers and homeseekers—all followed the river in search of fortune, adventure, fame, and a new life.

To pioneers the river seemed a made-to-order highway, with a current little faster than a man could walk . . . except in flood.

Sight of the Missouri in flood, raging, debris-filled, chilled the heart of Marquette who explored no farther . . . but not of succeeding white men. They took their chances, and fairly successfully, despite the river's uncertain, shifting channel.

Shallow at best, the channel changed rapidly, almost overnight. Boat after boat ran aground . . . but profits from transporting newcomers West as well as livestock, chickens and whisky outweighed losses.

Steamboat traffic became well established years before the Civil War. Daring pilots churned paddlewheelers hundreds of miles above Sioux City, Iowa.

Prairie Schooners . . . then Railroads

Prairie schooners—boats built for land travel to ford the Missouri's branches, the Platte, Kansas, Republican—crossed and recrossed the vast untapped territory . . . then came puffing steam locomotives on thin ribbons of steel, bringing more adventurers.

This penetration of Jefferson's Louisiana Purchase was fine, in the opinion of President Lincoln and his Congress, but not good enough for the country. It was not permanent settlement . . . farms, towns, as in the East. Congress passed the Homestead Act, offered other incentives.

Farmers and ranchers battled against the climate—drought . . . flood. As the valley's population grew, slowly, the problem of too little and too much water grew more intense, with more farms, ranches, people, towns pressing close along the river's course, for its water . . . for life.

frontier

Towns and other communities needed larger supplies of water—for drinking . . . for many other needs including early industry.

The Missouri—unpredictable, unreliable as the climate itself—had to do all this; there was no substitute . . . there is no substitute for water, the vital essential of all life.

Many of the pioneers trying to carve their living in the great region soon had their fill of the seeming inhospitable nature of this lonely windswept land with so little rain . . . destructive floods . . . cloudbursts . . . blizzards . . . insects. They packed belongings and pushed west—or north or south or anywhere, just to get away.

Rich Land

But others stayed. The land was rich . . . the soil deep and fertile . . . if only it would rain like it did in the East, fortunes would be made.

The Missouri valley was not like those in the East. It was drier. Only 10, 20, 30 inches of rainfall instead of 40 and 50. Worse, rain came in sharp showers that rarely soaked the earth but ran fast to the river, washing away topsoil, gullying the land, filling the "Big Muddy" with more mud and silt.

Snowfall was a better source of steady moisture—but both snow and rainfall were undependable. Good for a few years, then bad. A vicious cycle. A gamble. Farmers, ranchers, cursed dependence on the weather.

Irrigation

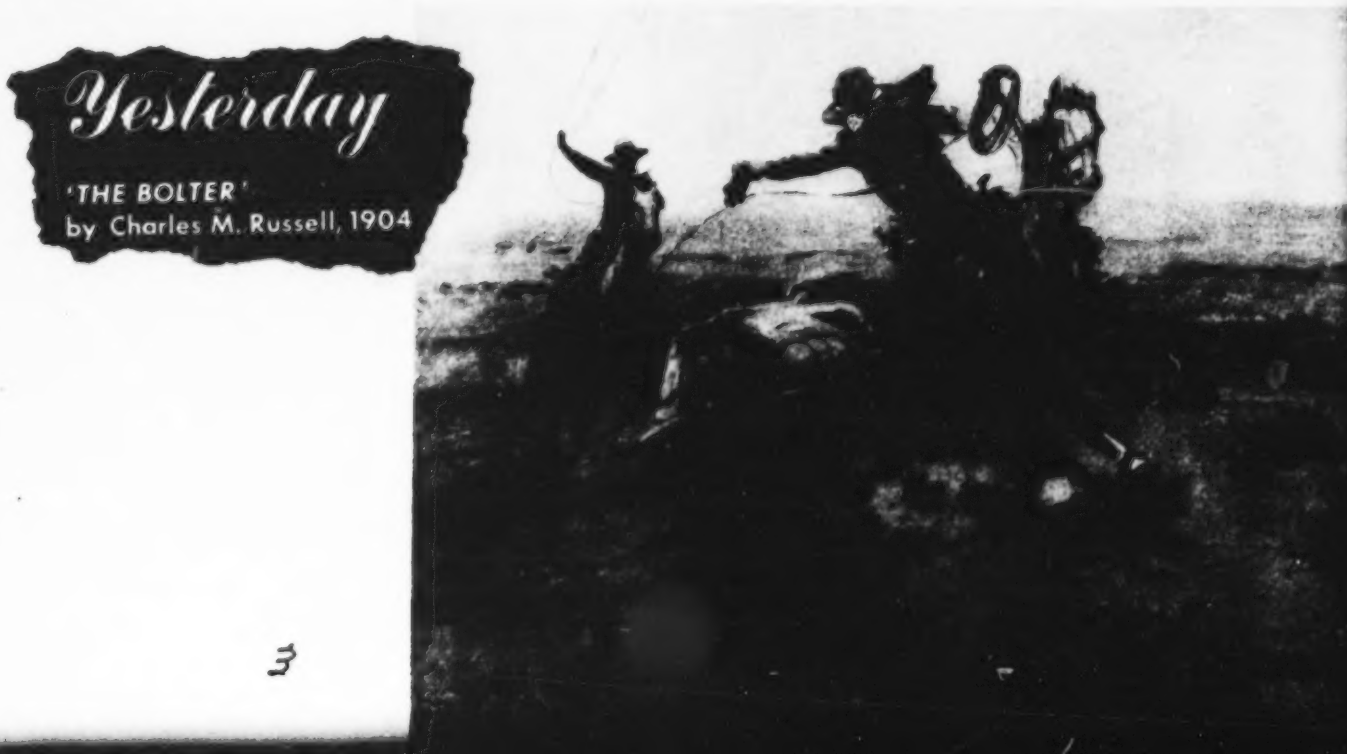
That is, all except those who could use the streams for irrigation. This was the answer to lack of enough rainfall for crops. Turn the life-giving water from nearby creek or stream into fields as needed.

Settlers who sensed the situation went in for irrigation wherever possible. They no longer depended on weather's whims and the cycle of wet years and dry years.

By 1890 over 3½ million acres of farmland were irrigated in the dry West . . . of which a good share was in the Missouri basin. Farmers, ranchers, private individuals, singly and in groups, pooling their money built dams and dug canals and ditches.

But all was not rosy for these irrigation farmers. Sometimes—too frequently—streams dried up. Crops withered and died.

And so another problem arose . . . and another solution: Storage . . . water in reservoirs backed up by dams . . . water to last through the growing season with some to spare.



More and more farmers in the West wanted to irrigate but not many could afford the larger, more expensive facilities required for storage instead of simple diversion. The Government entered the picture, building dams and canals for organizations of farmers that repaid the cost.

There were other needs and problems in the basin—navigation, floods, erosion, etc.—that individuals and groups had tried to, and could not meet themselves. State governments assisted as much as possible with their limited funds.

Even though population growth was held back by drought and flood, and the region's rate of growth fell behind the rest of the Nation, it nevertheless grew . . .

New Problems

and as it grew, old problems deepened, new ones added themselves.

World War I was an example. Farmers and ranchers were urged to produce as much as they possibly could in the emergency. They overstocked grazing land; result: Severe erosion. They plowed up land better suited to grass or trees; more erosion. They plowed, planted, tilled, produced with a vengeance . . . and a toll.

The Missouri ran dark with mud and silt washed off the land. Fertile topsoil, lost forever, filled ponds and reservoirs, clogged channels and damaged waterworks.

Then came the depression and its pressures, farmers plowing and planting more crops on unsuitable land in desperate attempts to maintain income in the face of barrel-bottom prices.

On top of this a protracted drought period . . . wind moved precious topsoil off ploughed land and lifted it up to the sky . . . dust storms swirled, reaching all the way to Washington, the Nation's capital.

Flood and drought, war and depression . . . the valley reeled. Thousands of families had abandoned their homes in the face of duststorms and falling water tables; others who stayed required public assistance. From 1930 to 1940 $2½ billion were poured into the area.

Then came World War II, another emergency demanding all-out production.

Critical Situation

World War II's conclusion could not be waited for, the situation was critical. The basin States recognized this; they organized to help themselves; they sought assistance. In 1944 the Federal Government adopted a comprehensive, basin-wide plan of flood control, irrigation and other development in which various Gov-

ernment bureaus formerly working alone would be a team, working together, cooperatively, to solve the complex problems of the vast, varied region.

This step was a natural evolution, on an expanded and coordinated basis, of work going on for 50 years. Now, however, disturbed by conditions, the Nation in this and subsequent acts signaled full speed ahead . . . on domestic, municipal and industrial water supplies as well as flood control, irrigation and navigation; on hydropower, sorely needed; pollution abatement; fish and wildlife, recreation, watershed protection: On multipurpose development.

The coordinated, cooperative program of action called for a three-way attack on floods: Retardation of run-off through improved land practices and upland structures; storage of flood waters in reservoirs; and protection by levees.

The Corps of Engineers builds dams, levees, floodwalls, and channel improvements. The Bureau of Reclamation also assists in flood prevention by including flood control storage in reservoirs of water for irrigation.

Watershed protection projects of the Department of Agriculture and land management agencies of the Interior Department and State and local agencies reduce damages from floodwater and sediment on smaller branches of the Missouri.

Large irrigation projects are being built by the Bureau of Reclamation and, wherever possible, Corps of Engineers dams also store water for irrigation. Eventually, these projects will add more than 3 million irrigated acres.

Navigation and bank stabilization works along the main stream from St. Louis to Sioux City are being built by the Corps of Engineers for a stable 9-foot navigable channel for barge freight. But these works also remove the bank-erosion threat to 1,300,000 acres of land and to cities, industry, railroads, highways, bridges and other construction close on river banks.

Power plants at multipurpose dams will have a capacity of over 2½ million kilowatts, and interconnecting transmission systems are being built.

The reservoirs will have opportunities for fish and wildlife and recreation development, and steadier, cleaner water supplies for cities and industry. Smaller structures also provide water supplies for farms and small communities.

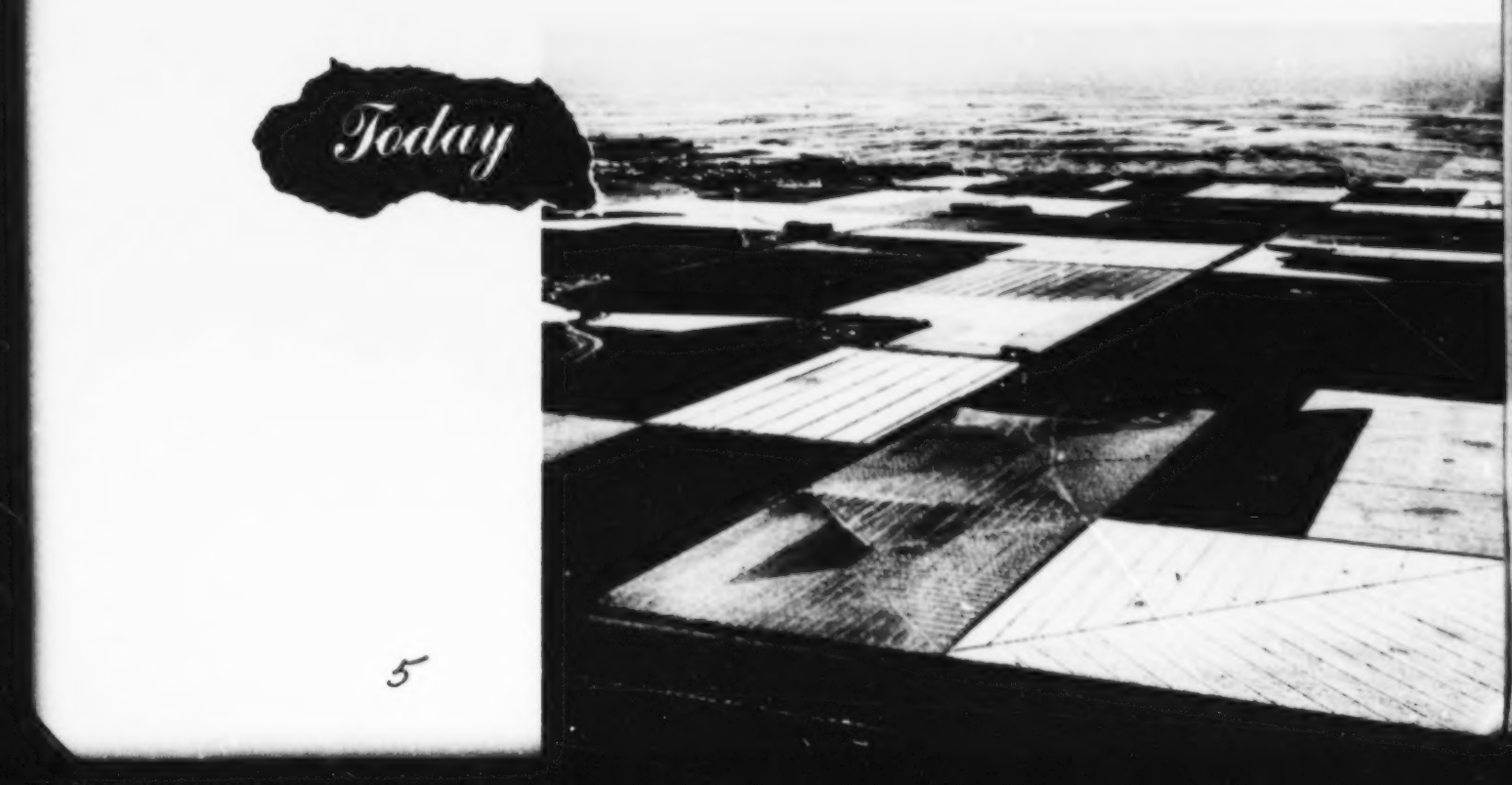
The Halfway Mark

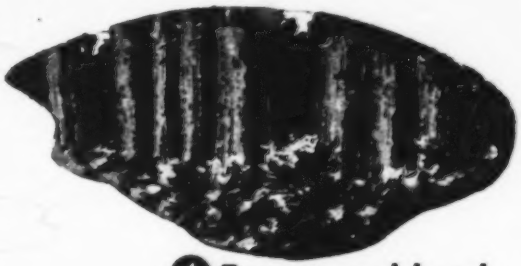
In 12 years of construction much has been done to control flood and droughts, soil erosion and pollution in the Missouri basin. More is needed. The work is still short of the halfway mark.

After over a century of experience in trying to settle the region, the Nation now knows that the region's problems are linked to control of its water supply . . . control of the Missouri River, from its source to its mouth and along its many far-flung branches.

With the river system controlled, and all its water available, full use of the basin's fertile soil and untapped mineral and other wealth follows.

This is the objective of the Missouri River basin development program.

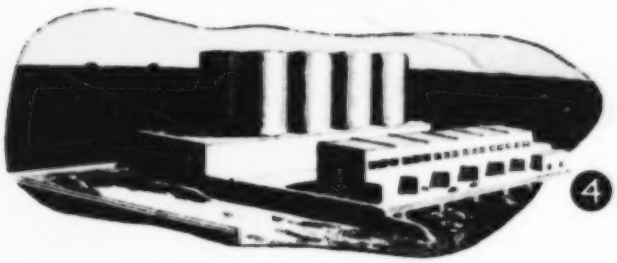




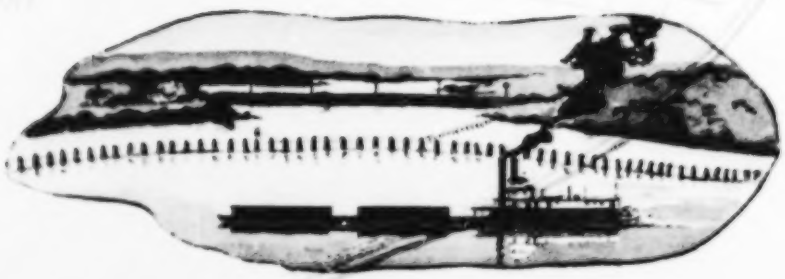
❶ Forest and land management

❷ Small watershed dams

❸ Tributary dams



❹ Dams on the main stream



❺ Channel improvement and levees

Harnessing the river

HARNESSING the Missouri is a Herculean job, and one that will never be finished, completely, in our time.

To control water in its endless cycle of falling to the earth, flowing to the sea, evaporating and condensing into clouds, and falling to the earth again—requires all our scientific and engineering knowledge.

Control must begin immediately, in the forest and on farm and ranch land. As water collects into millions of rivulets and thousands of brooks and creeks, additional control—the watershed dam—becomes necessary.

As streams get bigger, larger dams are required; multipurpose dams must be built, to serve many needs and put the river's water to full use.

Channel improvement and levees further control the river.

Foresters, meteorologists, biologists, agronomists—geologists, economists, chemists—all kinds of engineers, civil, agricultural, electrical, hydraulic, sanitary—are engaged in the enormous task.

Time is required. Building a single multipurpose dam sometimes requires years of preliminary work, surveying, mapping, measuring stream-flow, testing possible construction sites. Thousands of drawings and blueprints must be made. Then roads must be built for heavy construction machinery and equipment, materials and supplies; power lines must be run in; reservoir land must be bought and the site cleared; homes and other buildings erected—sometimes an entire city—for the workmen.

Then it takes more years to build the dam itself. Construction of Fort Peck dam in Montana, first big multipurpose dam—and first piece of heavy harness imposed on the unruly Missouri—required five years. The stupendous job of controlling the Missouri and putting its water to work for the benefit of the people of the Missouri valley and the Nation can be arbitrarily divided into five main aspects . . . five fingers on the guiding hand of man.

The first aspect is the land itself where the river really begins—where the river is born, so to speak, in rain and snow. Techniques of control include: *Forest management*—trees to break fall from the clouds, woodland mulch to sop it up; *soil cover*—grass and other ground-carpeting plants to cushion the soil-splashing impact of rain and reduce eroding wear and tear on the earth; *soil contouring and terracing* to slow down surface run-off and hold topsoil in place; *check dams and holding ponds* to help rain and snow soak into the ground slowly, preventing it from cutting ruinous gullies through ranch and farmland; *roadbank cover* and other stabilizing devices to hold road construction cuts and roadsides in place; *windbreaks* to prevent soil from being blown off in dust.

The individual farmer and rancher, on his own or with help from his State or Federal Government, has the responsibility for this initial aspect of control.

The second aspect of control—the small watershed dam—is also the responsibility of the individual, but with a difference: He is now one of a group of farmers and ranchers who have agreed to work together to conserve soil and water in their watershed. This watershed control group receives technical advice, information and financial assistance from the Government.

The third aspect of control takes up where the second leaves off, geographically as well as socially. Where small streams grow to sizable river branches, river control requires voluminous technical data and other information, a much larger financial investment, and the cooperative effort of many more people. Responsibility therefore swings into a State or Federal orbit in order to construct tributary dams almost as big as multipurpose dams on the main stream itself.

These tributary dams are usually multipurpose also, regulating river flow to cut down floods, irrigate farms, produce electric power, provide municipal water supply, and create lakes offering healthful recreation such as boating, swimming, fishing, picnicking, camping.

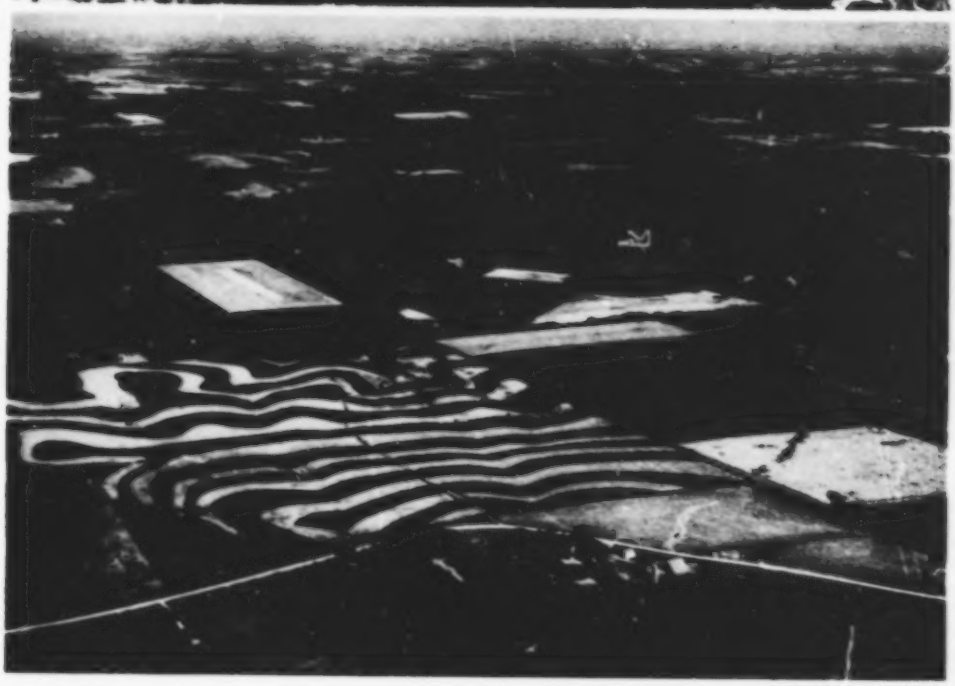
The fourth and most spectacular aspect of controlling the Missouri River is the series of great multipurpose engineering structures such as Fort Randall on the main stream of the Missouri itself in South Dakota.

The fifth and final aspect is bank and channel stabilization, dikes, levees, flood walls and revetment work, to keep the Missouri rolling along peacefully and usefully past farm and city instead of chewing away whole chunks of land, washing away homes, destroying towns, flooding and damaging the entire countryside.

This is the harness being placed on the Missouri by man's hand; these are the engineering techniques that will guide its water into many beneficial, constructive uses, and away from its wasteful, destructive ways.

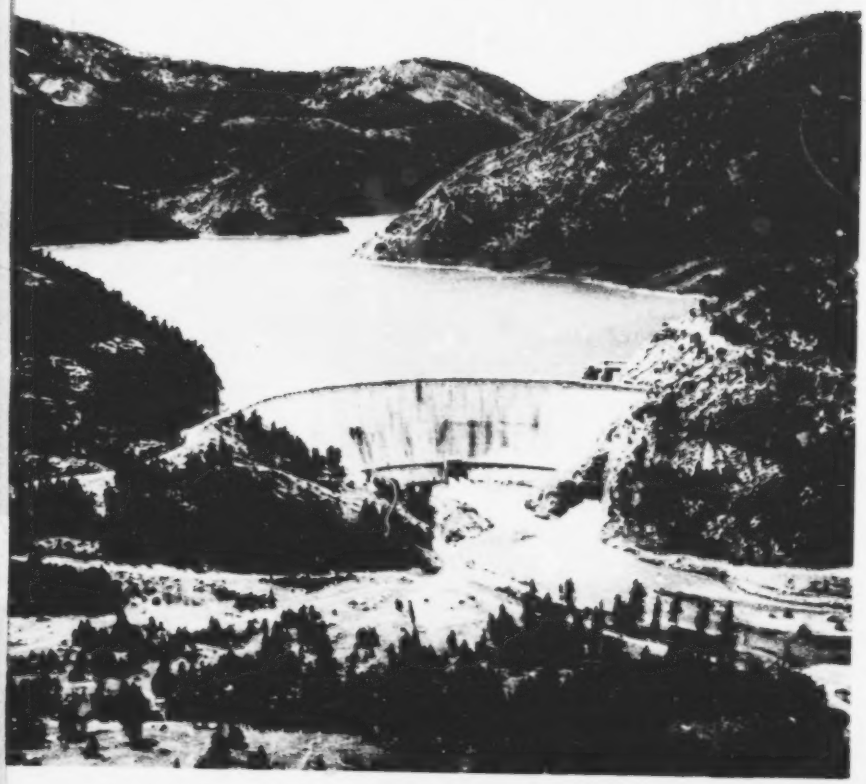
When the harness is complete, the Missouri's everlasting, unlimited capacity for creating wealth and a better life will always be available to the valley's people and the Nation.

First step in mastering a river is gathering facts on four raw materials: Snowfall . . . rainfall . . . streamflow, above ground and below . . . and the land with its intricate pattern carved by wind and water on its way to sea

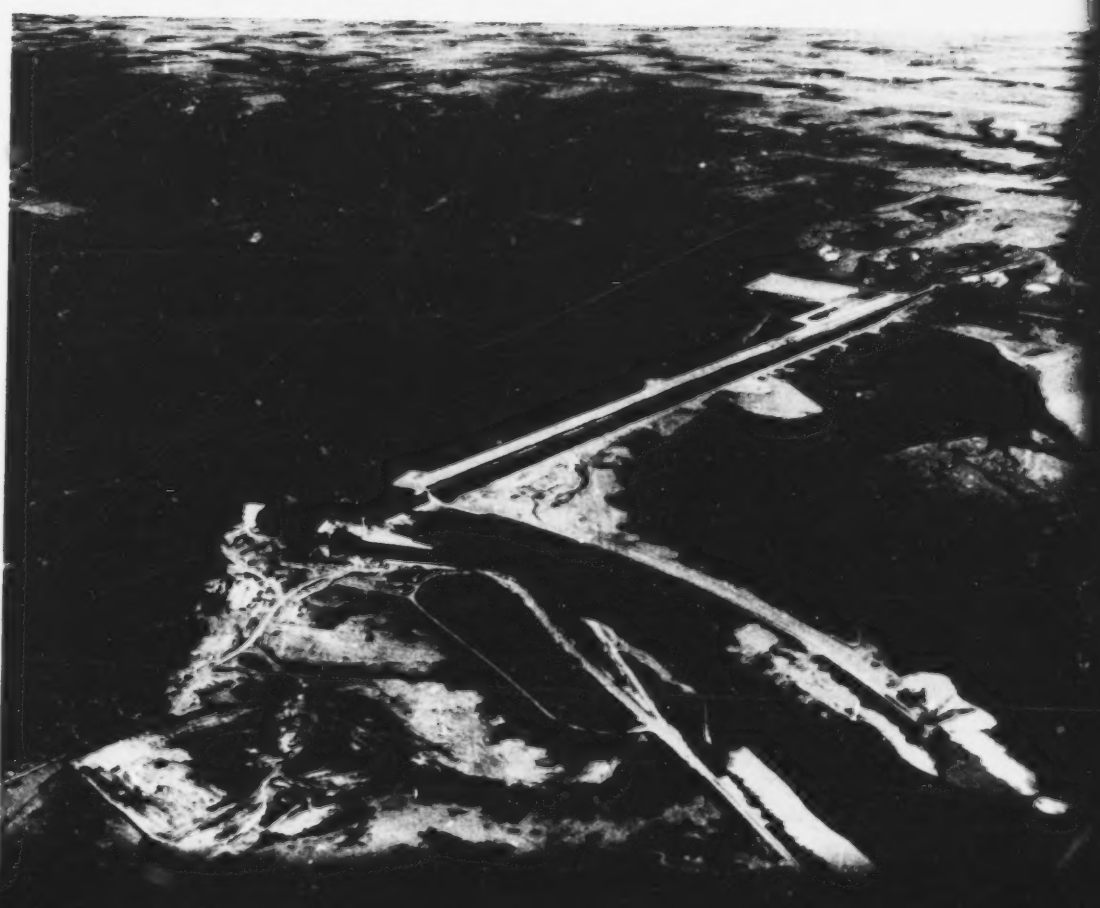


Top, Rocky Mountain forest; middle, strip cropping, Iowa; bottom, farm pond, Nebraska

Water is nature's carving knife. It must be guided by intelligent hands. Forest management, soil conservation, and water storage blunt its cutting edge

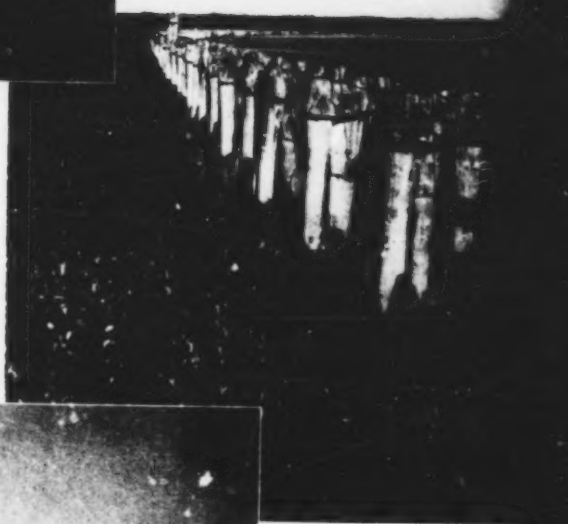


By the time water reaches larger streams it accumulates volume and force. Control requires larger and larger structures. Tributary and main stream dams create reservoirs of controlled water available for many beneficial purposes . . . multiple use

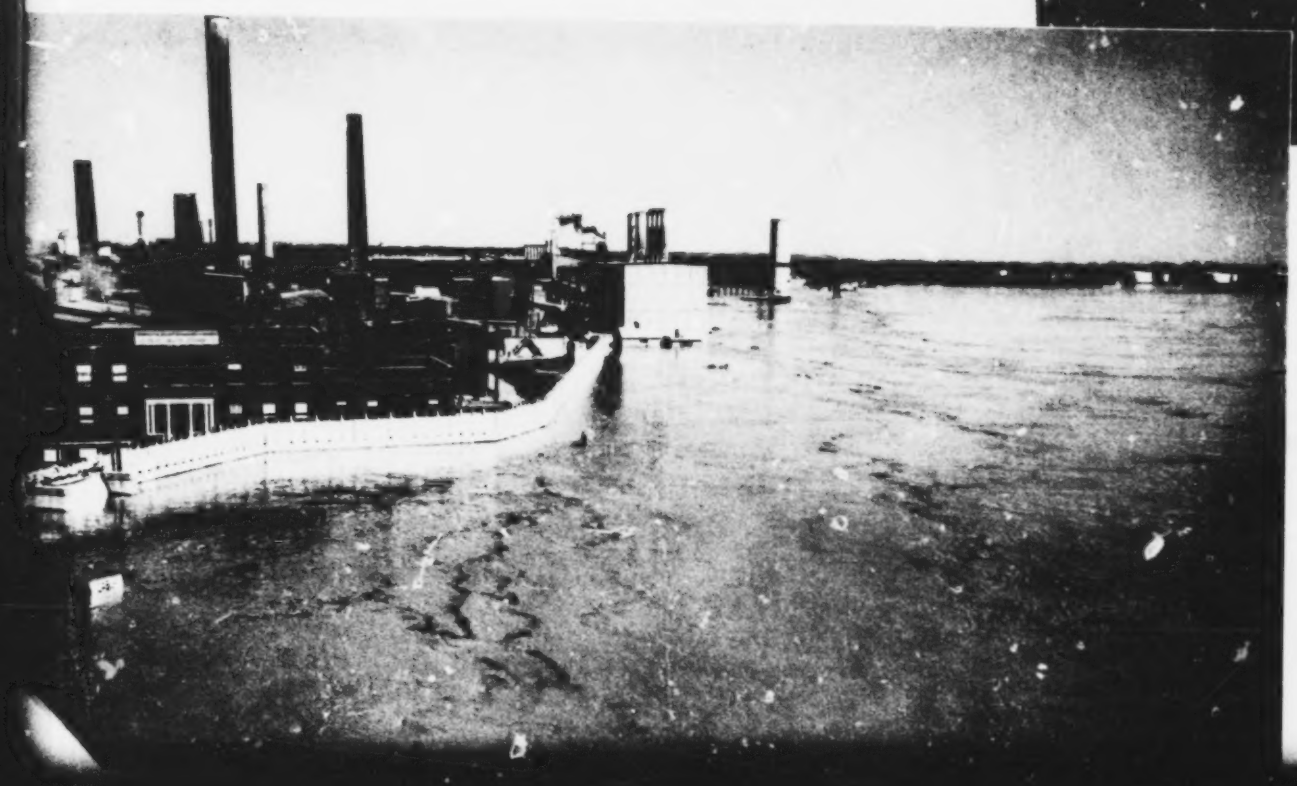


Above, Gibson tributary dam, Sun River, Montana; *right*, Gavins Point dam on the Missouri River near Yankton, S. D.

Left and below, training the Big Muddy to stay in channel by means of pile dikes; *bottom,* Omaha protected by concrete floodwall in record '52 flood



Local protection works complete the river's harness. Dikes and revetted banks stop erosion; levees and flood walls protect riverside, agricultural and industrial development. An inland waterway is created for bulk transport



Benefits from the

Controls floods

NO ONE knows how much damage Missouri floods have caused. Records do not go back far enough.

Recent records demonstrate the frequency and destructiveness of this great river uncontrolled. It had major floods in 1942, 1943, 1944, 1945, 1947, 1951, 1952, and 1953.

In 1943 the river outdid itself, going wild three times. Whole towns were drowned in swirling floodwaters. Thousands of acres of crops were wiped out, railroads and highways washed away, homes and factories destroyed.

The flood of 1951 was a colossus. Damage was $1 billion. Half a million people were driven from their homes.

That such disasters should have a retarding effect on expected growth of population, business and industry as well as agriculture in the valley cannot be questioned. Effects of a major flood are deep and long-lasting. Kansas City cannot be said to have yet recovered from the flood of '51.

All this is unnecessary. Floods, even the Missouri's, can be controlled. When Missouri basin development has been completed, they will be.

Progress can already be reported. Flood prevention construction has already saved nearly $1 billion damages. Industrial development along the river, valued at $2 billion, has increased 20-fold in 20 years.

Simultaneously along with flood control, other benefits flow: Irrigation, electric power for farms, homes and factories, adequate water supplies, and recreation. In addition, development work will provide a strong stimulant to regional economy. At the same time the region, its water and its land, will become a finer place to live and work in—and a worthy part of a strong Nation.

Prevention of the awful destruction of property—and countless personal catastrophes, disruption of lives and human suffering—is an end worthy in itself.

But storing excess water that ordinarily would rush destructively to the ocean makes greater benefits possible. Conserving this water for use when it is needed is as important as preventing floods. It allows maximum use of the valley's waters.

Glasgow, Mont., safe and secure behind flood protection walls

Missouri at work

Irrigates land

Only on a firm foundation of homeowners can modern civilization be solidly reared. Water is the first essential of life . . . food the second. Not until these two vital needs are met, and a roof erected overhead, can we find time for other activities, and leisure.

This is what irrigation can do for the dry Midwest wherever rainfall is too little for raising food crops. It makes possible the establishment of permanent communities . . . growing centers of population.

Otherwise much of the land, except for river bottomland, might remain as sparsely inhabited as a county in central South Dakota. Almost half as large as Rhode Island, this county in 1950 had only 12 taxpayers, no local government, not even a post office.

No nation can be truly strong if a sixth of its area right in its middle is sparsely settled and undeveloped, and largely agricultural.

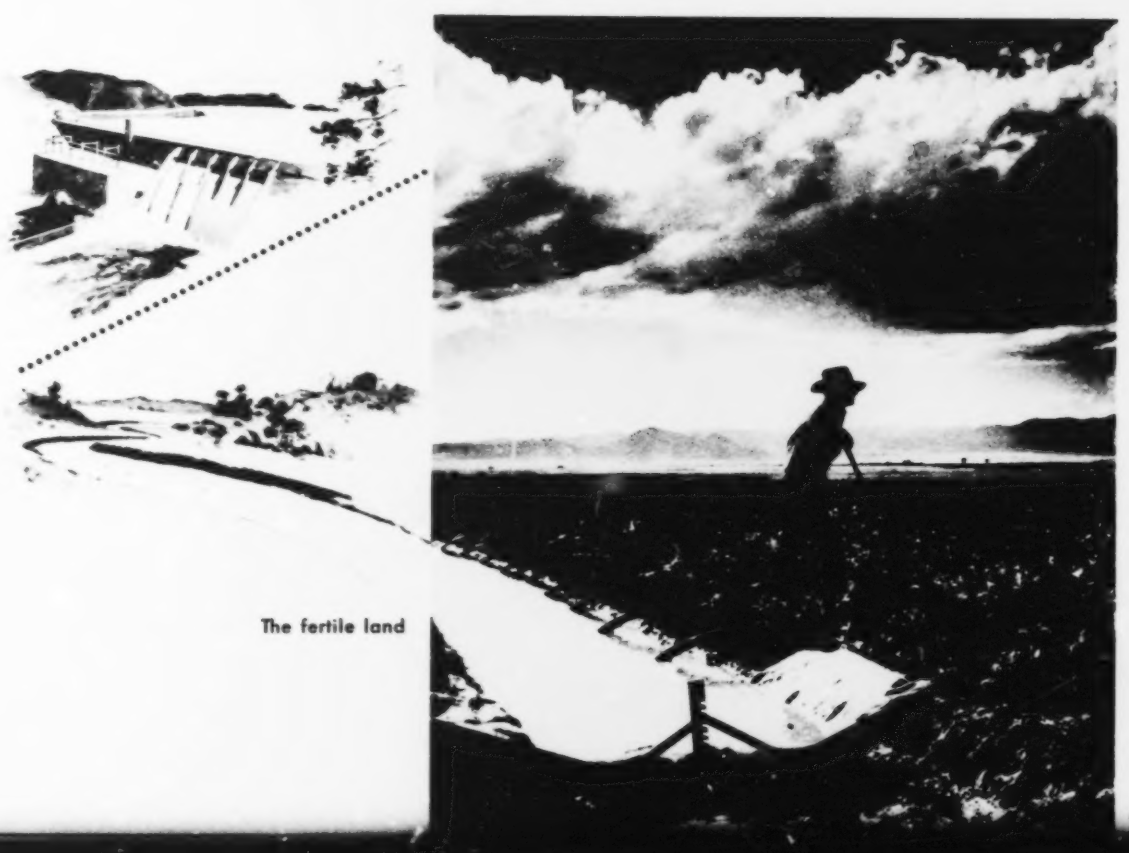
With a quarter of the Nation's tillable land, the basin produces one-third of its wheat and sugar beets; nearly half the rye and flaxseed; about a fourth of the corn, oats, barley, livestock and wool.

The valley's one-sided almost wholly agricultural economy, dependent on the weather, teeters between good and bad. Farmers and ranchers can be flush with good prices and crops one year and in financial trouble the next.

Availability of water for irrigation turns farmers away from precarious dry-land farming of wheat and corn to stable intensive cultivation of special crops such as fruit, vegetables, seeds, flax, alfalfa, sugar beets and clover hay.

Permanent, stable, self-supporting communities based on an irrigated hinterland offer a steady, ever-expanding market for American industrial goods.

When permanent communities are created, other development follows, such as mining, manufacture, and service industries.



The fertile land

Transports goods

Rivers are natural highways. From time immemorial they have served to carry men and goods, especially goods of great bulk.

Modern civilization has its speedier means of transportation, rail, road, and air—but waterway freight will always have its place. Just as the national economy requires many sources of income for stability, so its transportation system must have available all modes of movement.

Improvement of navigation traditionally has been considered national responsibility. Navigable rivers are public property . . . therefore public highways to be kept open to traffic.

When the Missouri is fully harnessed channel dredging work will be lessened. Controlled release of reservoir water from dams will keep the river deep enough for barges heavily loaded with the valley's products for the Nation and the world.

At the same time, reservoir releases when the river is low will maintain an ample supply of water for towns and cities dependent on the river for drinking and sanitation.

At present steel, oil, grain and other bulky materials are being transported on the Missouri. With an adequate channel, tonnage of such goods swelled by coal and other minerals may be expected to increase greatly.

In the old days the Missouri was a busy highway for steamboats carrying prospectors, hunters, trappers and adventurous passengers. With its flow evened and its channel stabilized, the Missouri can once again become a well-traveled highway for people as well as freight . . . tourists, excursionists, and travelers who prefer the leisurely, safe, scenic way.

Highways of history—arteries of defense

Makes electric power

One of the most important benefits we get from harnessing the Missouri River is electric power.

Electric power not only helps develop land and mineral resources of the region—but also helps pay for the harness.

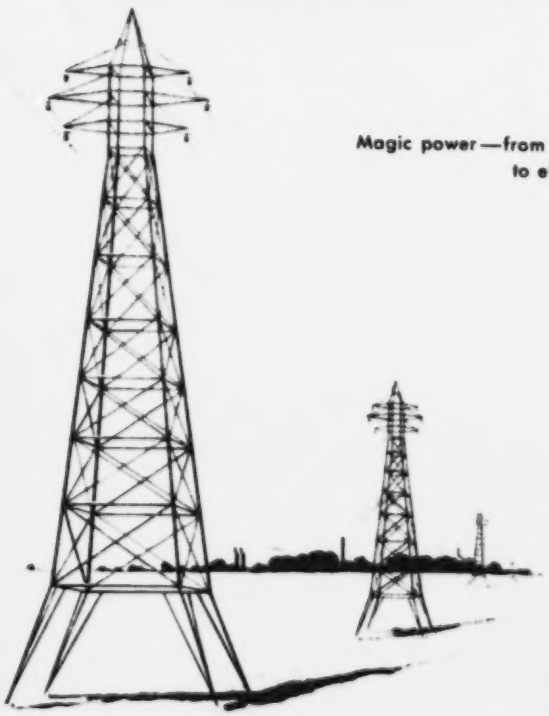
Power generated at river dams is sold to rural electric cooperatives, municipalities, power districts, and private utilities. Money received from its sale is used to pay part of the cost of building the dams and developing irrigation.

Industry in the basin, especially development of huge reserves of phosphates, manganese, uranium, and other valuable minerals, must have power.

Millions of kilowatts of power are latent in Missouri waters. The harness will develop at least 2½ of these millions.

But this still will not meet the growing demand for power in the Missouri basin. By 1970 the area will require 15 million kilowatts—about twice the capacity now available—a requirement that can be met only by substantial expansion of private power systems, interconnected with public hydro developments, pooled together for common good.

Electricity lights and powers farms and factories, and thousands of homes. To homemakers, electricity is a magic wand that transforms kitchen drudgery into satisfied pride.



Magic power—from water turbine to electric kitchen

Serves homes and factories

Over washbasins in rooms of the best hotel in a city in North Dakota is a sign: *Do not use this water for drinking.*

This city has little industry—and will have little chance to grow unless it gets a good supply of water. Factories use more water than homes.

This city is one of a number of communities that will be saved by the control harness being placed on the Missouri River. They will get a supply of water fit for all use, including industrial. Water supplies for other towns and cities, now using 250 billion gallons yearly, will be made more secure.

No other benefit from controlling the great Missouri rates higher in actual importance than domestic and industrial water supply, even though it accounts for barely 5 percent of the total to be made available for all purposes. Water is the first essential of life for cities and industry as well as for human beings, animals, or plants.

In a single drought year (1956) in 13 Kansas counties alone, farmers and ranchers had to spend over $4 million to haul water for family and farm use.

The same drought caused failure of 90 percent of city public water systems in Kansas or compelled city officials to curtail use by townspeople.

The region lacks good ground water in many places. Surface water from streams must meet this deficiency.

Water is the key to all development in the Missouri basin, now and future. As the basin develops and population, industry, and agriculture expand, more and more water will be needed.

We are using nearly ten times as much water as in our grandfather's day on the farm. Our children in turn will be using still more. Modern industrial and technical life—needing more than half a trillion gallons each year in the Missouri basin—continually finds new uses for water; demand for this universal, fundamental commodity outstrips all other material needs for a more comfortable living.

Even with the great Missouri fully harnessed, there will not be an excess of water, that can be wasted. Every drop of Missouri water will have to be used to its fullest extent; none wasted, none polluted beyond possibility of reuse later by somebody farther down the river.

Small valley towns generally get their water from wells, but most larger cities get theirs from a surface source—the river and its branches.

The Missouri already is polluted along a large part of its length; but over 2 million people must use it as their only available supply, for drinking, after purification. Surface water must always be purified before use; the heavier the pollution, the more costly and careful the purification process.

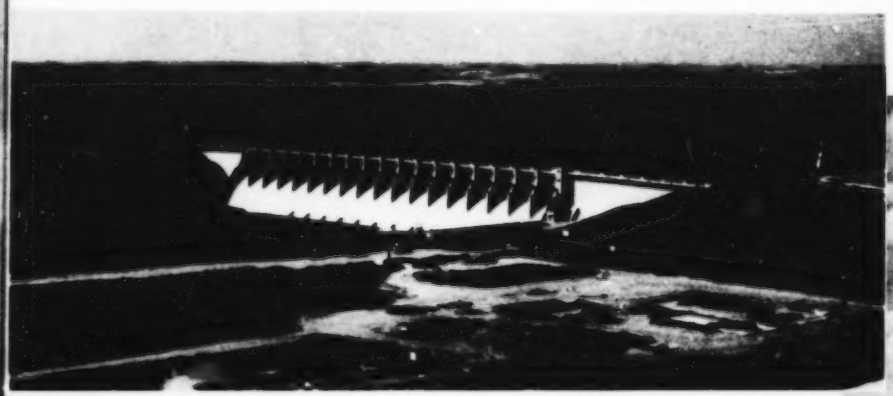
Water purification

Sewage and industrial waste are the main pollutants. Prevention is cheaper than cure: Waste water from homes and factories can be "treated" to remove a substantial part of its impurity before discharge into the river. Then, if the river has enough water flowing in it, and time enough, most of the impure matter still remaining after treatment will decompose naturally . . . the river again becomes usable with ordinary waterworks purification.

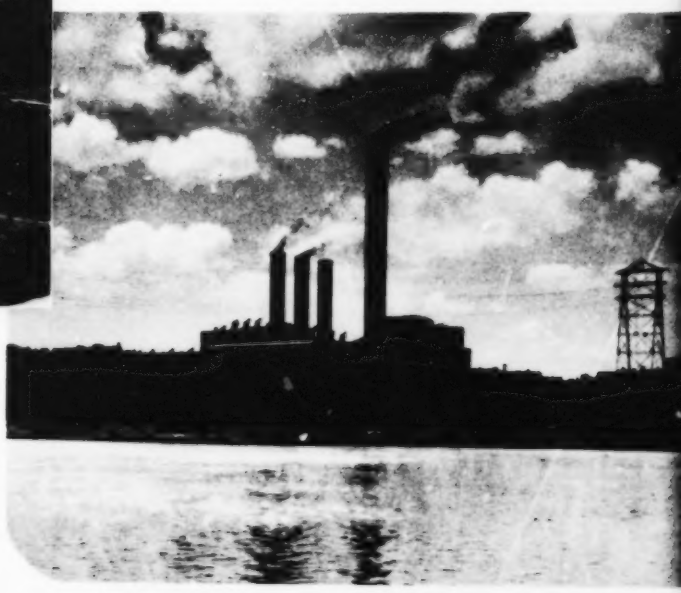
In regulating the Missouri to prevent floods, irrigate land, generate electricity and improve navigation, dams will also maintain a flow steady enough to meet requirements not only for drinking and other consumption but also for carrying off treated sewage and other wastes safely.

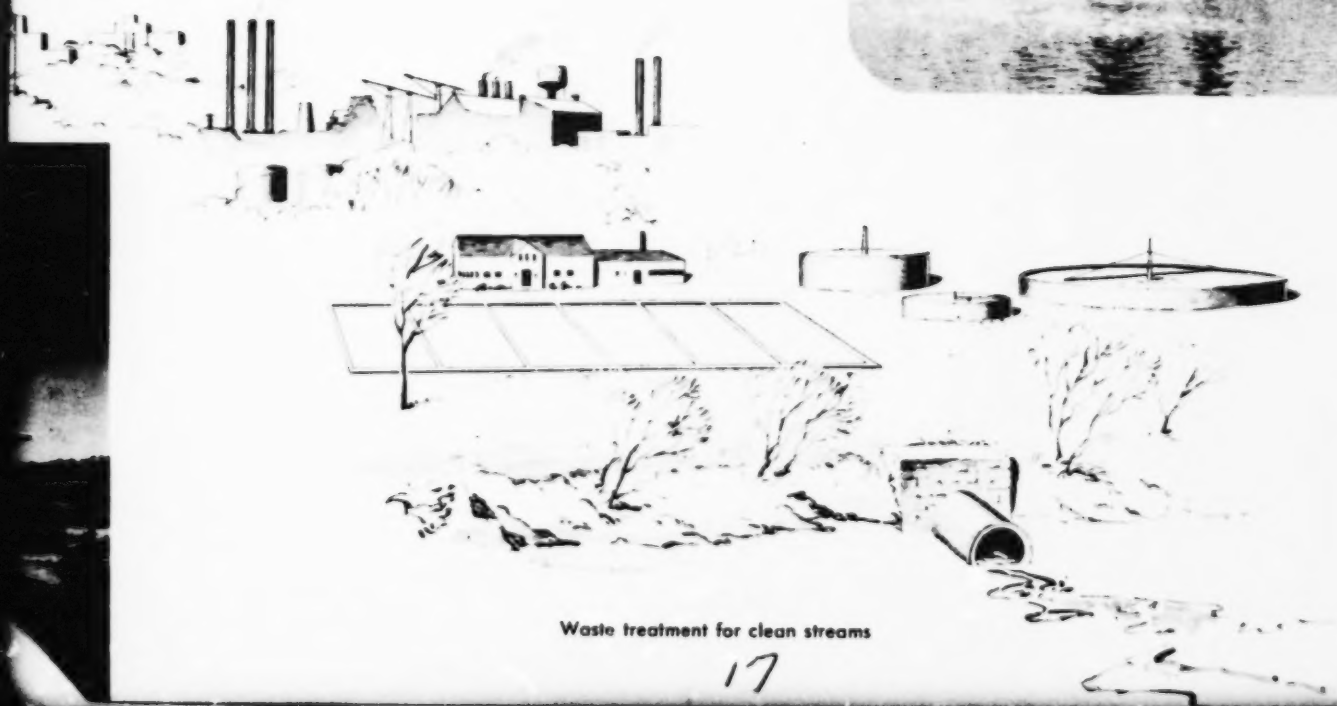
Control of the great Missouri requires waste treatment as well as water purification for all towns and industry. For full development of this great valley and its immense resources, full use must be made of its water.

Full use of the river means reuse over and over again, up and down its entire length. Only this way can we get the most for our money in developing the basin's primary resource: Its river.



Left, Harlan County dam, Republican River, Nebr.





Waste treatment for clean streams

Provides recreation

Recreation presses agriculture as the Missouri basin's leading source of income. Recreation is big business—tourists alone leave over $1 billion yearly behind them.

Outdoor recreation draws more millions of vacationists to the region each year. Its scenic and wild areas, unusual geologic formations, and fish and wildlife resources are unequaled.

In an age of air-conditioned indoors and an unnatural tension of living by the hand of the clock instead of by the sun, outdoor recreation is an increasing need for health of mind and body.

The closer to nature our recreation is, the more therapeutic and more healthful it becomes. Leaving the unnatural for the natural, we find rest, relaxation, and a renewal of vital forces to keep mind and body in balance.

Of all forms of outdoor recreation, water offers greatest appeal. We are instinctively drawn to water, if only to drive where it is and look at it while we rest and relax.

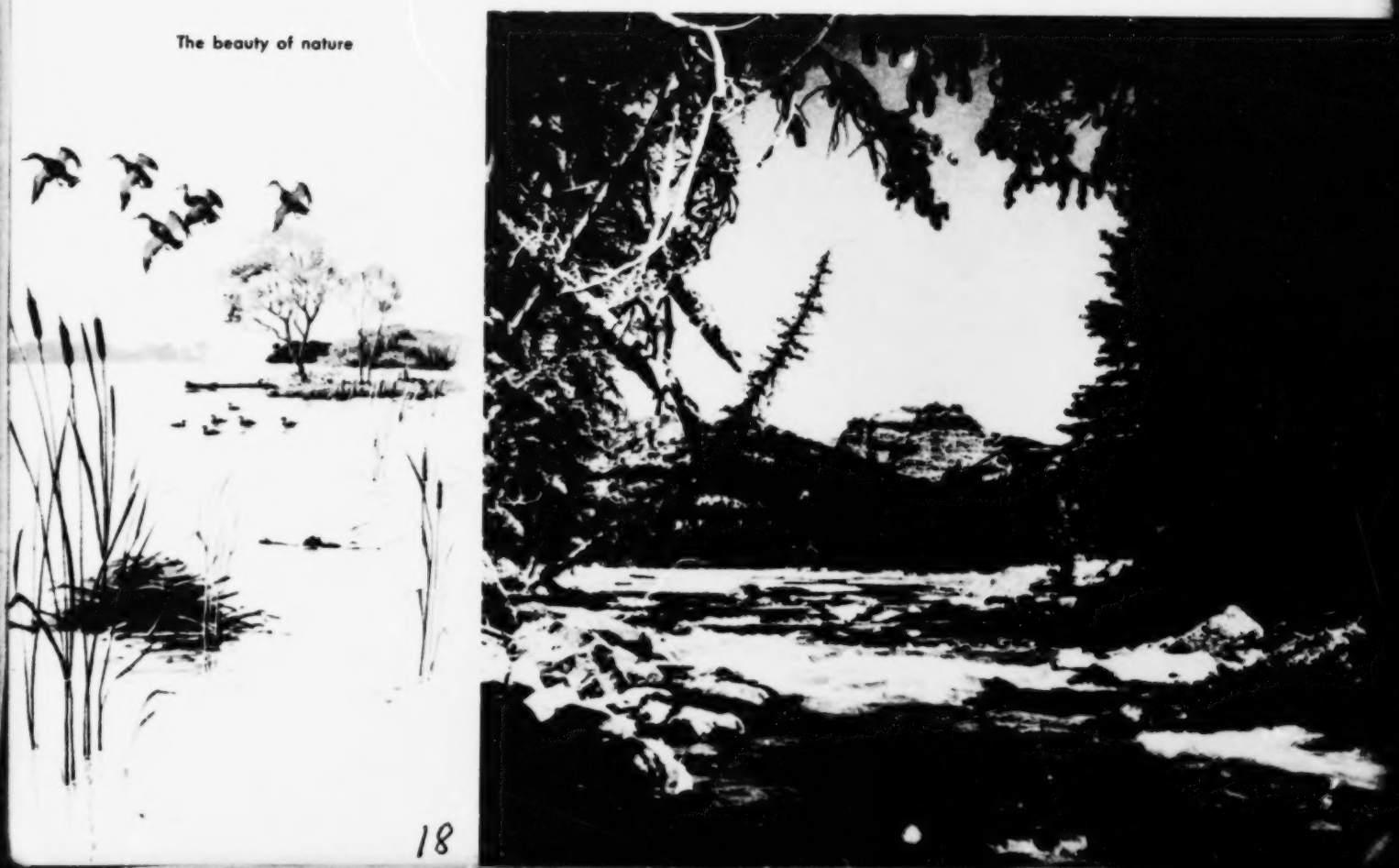
Given a chance, we picnic near it, camp on the bank, go boating, fishing, swimming, and of course, skating on it in winter.

Reservoirs formed by multipurpose dams being built on the Missouri to control its floods, irrigate land, generate electricity, improve navigation, provide municipal and industrial water supply, and lessen pollution, are splendid recreation assets. In this dry area, these great bodies of water—some with a thousand miles of shoreline—have unique appeal.

A staff writer of the Minneapolis Tribune, writing about "The Changing Face of the Dakotas" in 1957, was impressed by the sudden new boating, fishing, and tourist business springing from the recreation values of the big reservoirs.

"In Chamberlain (he wrote), a scenic town of 2,250 persons on the Fort Randall reservoir, a car dealer now makes more money from boats and outboard motors than from car sales. This in a land where many people had never been in a motorboat before."

The beauty of nature



Over a hundred dams and reservoirs will be needed to help control the Missouri. In each case recreation values will receive attention—access roads will be built and basic facilities provided.

For example, Gavins Point, smallest of the seven multipurpose dams on the mainstream, and lowermost on the river above Sioux City, Iowa, will have a round dozen recreation areas reserved for public enjoyment, with access roads to each, along the reservoir's 100-mile shoreline.

Of inestimable value will be man-made lakes where natural lakes are rare. They will complement existing scenic wonders.

Outdoor fun and relaxation: *Left*, Buffalo Bill reservoir, Wyo.; *below*, Heart Butte reservoir, N. D.

Land conservation is Water Conservation

Water holds the key to prosperity in the Missouri basin . . . all its water should be conserved and put to full use, none wasted.

The earth's landscape is a priceless living Oriental rug laid down by the Great Weaver . . . its warp is the land, its woof the water . . . and its deep, rich, colorful pile is the life that lives on the web of the two. Each is interwoven with the others.

Land is not one separate thing and water another . . . nor is the uncountable multitude of beings that lives and grows and dies on this combination of land and water a third thing. The three—land, water, and living things—are a single fabric, a trinity.

All land, even desert, contains water. Plants are composed very largely of water. Animals, too, are over two-thirds water.

Under favorable conditions, roots of plants penetrate land to an amazing degree: Alfalfa, for instance, itself only about 3 feet high, goes down into the earth 30 feet or more, with millions of rootlets permeating the soil.

As for land being intermixed with water, the Great Muddy—Indian name for the Missouri—speaks for all flowing streams.

So, in conserving water, one must also look at the land, because water is part of it. To make full use of water, one must make full use of soil. In making full use of soil, one also makes full use of water.

In short, land conservation is water conservation and vice versa . . . what helps one, helps the other; what conserves one, conserves the other.

In the process of conserving and making full use of both land and water, we make the earth produce more bountifully. The earth's lasting fruitfulness may be regarded as the measure of our success in conservation.

The bomb-like splash of a single raindrop

Properly used land is our greatest reservoir of water

Greatest Reservoir of All

In controlling the Missouri River, Federal and State engineers are building dams and creating many reservoirs. But the land itself is the greatest reservoir of all.

Over a half-million ranchers and farmers are also helping to put on the Missouri's harness by conserving water in the reservoir of the soil and putting it to full use with good woodland, range, and farm practices.

Progress in good land practices is being made throughout the basin. Acreage in State-organized soil conservation districts totaled nearly 276,000,000—82 percent of the total tillable land.

Federally owned land in the basin—20 million acres chiefly up in the headwaters—is also being wisely managed as a public trust.

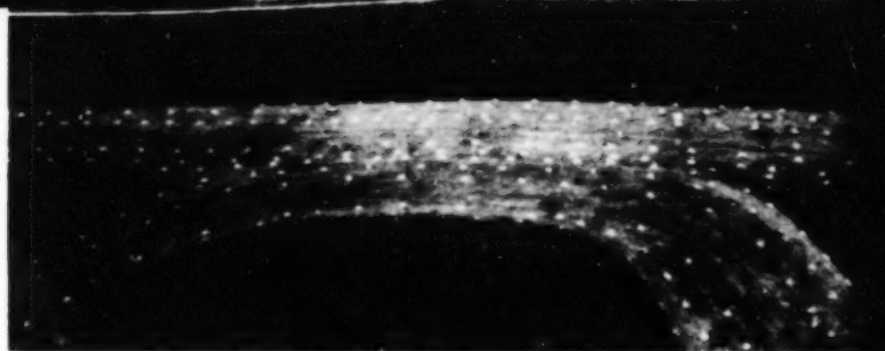
Forest, Range, and Farm

Nothing rolls off the punch of a violent soil-splashing rainstorm and its billion little bullet-like raindrops more harmlessly than a tree. Nothing releases runoff of rain and snow more slowly than a forest. Trees reduce erosion, soil-wash.

Forestry management in the Missouri basin will more than double income from timber and pulpwood. It will also foster wildlife, preserve one of the area's important recreation assets, and conserve water and land.

Range management will not only increase livestock carrying capacity but cut down on a prime source of silt in streams and reservoirs, to the benefit of both.

With the river controlled and its basin in agricultural harness, farm income will step up $750 million yearly, crop production and the livestock industry will be stabilized, soil erosion and sediment damage will be reduced, and as much rain and snow as possible will be retained on the land.



. . . and yields greatest benefits

Applied Democracy

The basic essence of democracy is voluntary cooperation . . . individuals working together of their own free will toward a common goal of individual betterment for the common good.

The plan for comprehensive development of the Missouri River basin is applied democracy on a grand scale.

General economic improvement is the immediate aim, for the sake of improving the economic condition of its individual residents. Ultimate result will be the common good not only of its residents but all Americans.

It was the personal plight of individuals living in the basin that drew national attention to its economic illness and aroused national desire to remedy the situation.

In the 1930's the worst drought in a century combined with depression and floods forced thousands of residents to seek a new life elsewhere. Other thousands who stayed required public assistance, $2½ billions of it.

From 1930 to 1940 while United States population increased 7 percent and that of western States as a whole nearly 15 percent, four basin States—North Dakota, South Dakota, Nebraska, and Kansas—actually lost population. Three others—Missouri, Iowa, and Montana—also fell behind national gains.

Federal Funds

Economic development requires expenditure of money as well as effort. From earliest days our Federal government has assisted such development, supplementing private individual activity.

Residents have not been laggard in financing development of the area. By 1940 privately financed irrigation activity, for example, had built over 200 reservoirs that watered five times as much acreage as had been developed under the Reclamation program.

98th Missouri Basin Interagency Committee meeting, Des Moines, Iowa

Economic studies of the basin's plight clearly proved that development was not only long overdue in relation to the rest of the Nation, but dependent on a larger degree of Federal investment.

World War II

But World War II was upon the Nation. And despite the decade of travail just weathered, the basin responded beyond all expectation. It poured out

nearly a fourth of the beef, mutton, wheat, and corn—meat and bread—needed by a Nation at war.

To produce this tremendous quantity of food from its comparatively few ranches and farms, and in the face of major floods nearly every year of the war, land was pushed to the hilt. More than ever, ranchland was overgrazed and cropland overcropped.

At the same time in the urgency of conflict, protective river works were neglected such as channel work, levees and revetment work, and waste treatment plant construction to hold down pollution of vital water supplies.

It was obvious to the people of the United States and their representatives in the Congress that something had to be done about the Missouri basin situation—and as soon as possible.

Congress did not wait for World War II to end. Anticipating victory, the Flood Control Act of December 22, 1944, set the stage for a comprehensive, broad-front attack on valley problems.

Immediate aim was controlling the river. Multiple use of its water and development of all other rich resources were to follow.

A Historic Milestone

Bringing together the divergent interests and needs of such a large region into one package plan of comprehensive development was not a simple task. It required educational effort, broadened public understanding of the problems involved, and closer coordination of Federal planning by Government agencies having responsibilities in the field of water and soil resources. Equally important was the need for closer unity and cooperative effort among the basin States.

The leadership required to bring about this understanding and cooperative approach was provided by individuals, community and regional organizations, members of Congress and the Governors of the basin States. For this purpose, the basin Governors had organized the Missouri River States Committee. It was composed of the Governors and two members appointed by each. This committee still functions to coordinate State interests.

The program authorized in 1944 was based upon two Federal agency proposals, one recommended by the Corps of Engineers in the summer of 1943, and the other shortly thereafter by the Bureau of Reclamation. Each was based upon responsibilities assigned to these agencies by law.

The Corps plan provided for a series of dams and reservoirs on the Missouri River and its principal tributaries primarily for flood control and improvement of navigation, but with multiple-purpose storage of water for other desired purposes. It included local flood protection works, agricultural levees, bank erosion and channel stabilization works.

The Bureau plan provided for a large number of

Nerve center, Omaha, Nebr., for regulating and synchronizing 2,000 miles of Missouri River flow

tributary dams and reservoirs primarily for irrigation and land reclamation, but with provision also for storage and multiple use of water resources, including power and flood control benefits.

The Congress combined these two plans into one overall program . . . the Pick-Sloan Plan . . . for water resources control and development in the Missouri basin. This was accomplished in a manner so as to combine the best features of both and to give the people of the basin the most comprehensive program on such a large regional basis that had yet been devised in this country.

Cooperative Action

The plan of development—a verdict of the majority, and, therefore, the will of the people—was cooperative not only in conception but also in execution.

For an intelligent, effective attack on complicated problems involved even in a single project in the plan, the two agencies found cooperation necessary not only between themselves but with other Federal agencies working in the area, and with the States.

The Soil Conservation Service, for instance, was helping ranchers and farmers build small check dams and stock ponds among other things designed to conserve water and soil.

The Geological Survey made topographic maps and measured stream flow and ground water. The Weather Bureau measured rain and snowfall. The Bureau of Public Roads was experienced in highway construction, and was concerned with rerouting roads around reservoirs. The Bureau of Mines investigated mineral resources. The Federal Power Commission appraised power needs. The Public Health Service, working through State governments, helped cities and industry with water supply and waste treatment plant construction to minimize stream pollution.

All these and other Federal bureaus had valuable information and experienced employees useful in carrying out the work of developing the valley's water resources effectively.

Equally important, State governments—closer to the people and therefore better acquainted with local situations—cooperated in developing the plan.

All in all, more than two dozen Federal agencies and bureaus and ten State governments with their various departments were engaged in activities directly or indirectly affecting river control and development.

Coordination

Broad outlines of the plan were already laid out but details had to be developed as work went along. Cooperation of high order was necessary, but also—in absence of a single directive voice to reconcile opinion and determine methods of approach—coordination.

Realizing this, Federal and State agencies joined in setting up a coordinating body—the Missouri Basin Interagency Committee.

This committee, known familiarly as MBIAC, today has 17 members, comprising ten State governors and seven Federal representatives from the agencies responsible for planning, assisting in, or constructing parts of the work.

As the top coordinating body in the development work the MBIAC has the authority of prestige and overall knowledge of the thousand and one development activities going on simultaneously throughout the basin. It meets bi-monthly to help Federal and State agencies settle questions that arise and keep the program moving along smoothly and efficiently.

Essentially the MBIAC is a "board of directors" for Missouri River basin development. As such it establishes permanent and temporary subcommittees to carry out predetermined policy.

Most important permanent subcommittee of MBIAC is the programming subcommittee—an executive arm to carry out MBIAC wishes and to keep its members informed.

Investment

Developing water resources, building highway systems and other broad improvements are investments in future growth and prosperity of the Nation.

No city, State or region in America can progress without investing in sound developments to serve the people. The Missouri River Basin Program will represent, in the long run, a total Federal investment of nearly $6 billion, of which $5 billion, including $1 billion in interest will be repaid to the Federal treasury. This does not include reclamation projects authorized before 1944, and the national agricultural program.

Hydroelectric power, the project's big revenue producer, will repay the full power investment with interest, about $2.2 billion and in addition, $2.4 billion of irrigation and other costs, a total of $4.6 billion.

The irrigation investment will be repaid in full from direct payments by irrigators and power revenues. According to law, however, no interest is charged on the irrigation investment. Municipal water users pay the total cost of municipal water facilities including interest.

A substantial part of the total investment—approximately $1.7 billion has already been spent for works completed or under construction. Returns from that investment are even now flowing back to the Federal

treasury. Hydroelectric power revenues now total over $17 million annually and are growing as production increases. The completion of the program authorized under the flood control act of 1944 will require an additional investment of over $4 billion.

Other facets of the overall water and land resource development program have not been delineated to a point where cost can be accurately determined. Approximate estimate indicates it may run to about three-fourths of the presently authorized cost.

This region, prospering under the developments in this program, is paying back in income tax returns increasing annual tax dollars.

Other returns—prevention of flood losses, conservation of vital water supplies, saving soil, and development of a sounder and more prosperous economy in this one-sixth of the Nation will have a value far beyond cash repayments . . . or the total original investment.

While only about one-third of the total investment has been made in the program—and much of that for works that has not yet been completed or carried to the point of being operable—substantial returns are being realized.

For example: At Glasgow, Montana, a local flood protection project costing $24,800, has prevented damages totaling over $586,000 since it was placed in operation in 1939; at the Kansas Cities, $569 million; at Omaha, Nebraska, $22 million in savings have been credited to the levees.

Nearly seventy cents of every dollar invested in the Missouri River Basin Program will be repaid in cash, which is only a small part of the total return to the Nation.

●

Missouri Basin Development Program Facts

Item	*Unit*	*In Operation*	*Under Construction*	*Remaining Program*	*Total*
Reservoir	Number	27	6	70	103
Capacity to store water	Acre-feet	59, 647, 100	27, 358, 000	21, 810, 000	108, 815, 100
Water surface—top of conservation pool	Acres	792, 901	355, 540	358. 333	1, 506, 774
Power plants	Number	8	3	16	27
Installed capacity	Kilowatts	847, 200	907, 000	757, 000	2, 511, 200
Average annual energy production	Million kilowatt-hours	4, 648	2, 332	3, 254	10, 235
Transmission lines—circuit miles [a]	Miles	4, 712	232	[b] 1, 303	6, 247
Irrigation units	Number	6	12	125	143
Area furnished full water supply	Acres	71, 267	151, 450	3, 115, 103	3, 337, 820
Area provided supplemental water	Acres	60, 610	64, 613	569, 080	694, 303
Area furnished flood protection	Acres	2, 750, 000	250, 000	670, 000	3, 670, 000
Local flood protection works	Number	18	12	16	46
Population receiving flood protection	Number	870, 000	65, 000	43, 000	978, 000
Levee construction	Miles	358	350	1, 260	1, 968
Channel improvement	Miles	64	819	21	904
Watershed protection	Number	16	12	[c]	
Area under watershed development	Acres	64, 614	2, 595, 430	[d]	

[a] Includes Fort Peck project
[b] Only includes program through 1964
[c] Not determined
[d] Determined only as local interests initiate and contract for watershed protection projects

Water controls

COMMISSION after commission had been appointed, survey after survey made of the economic weakness of the Missouri basin—a weakness adversely affecting the strength of our country.

Commissions, surveys and studies proved their findings with arrays of facts, figures and cases—in thick, bulky publications with thousands of words. Findings were almost as complex as the basin's problems; but without exception, unanimously, all pointed to one conclusion.

Water the Key

Water. Water holds the key. Water controls the future. The Missouri basin's future lies in the use made of its water. Control the river, make full use of its water, and basin problems, no matter how complex, are on the way to solution.

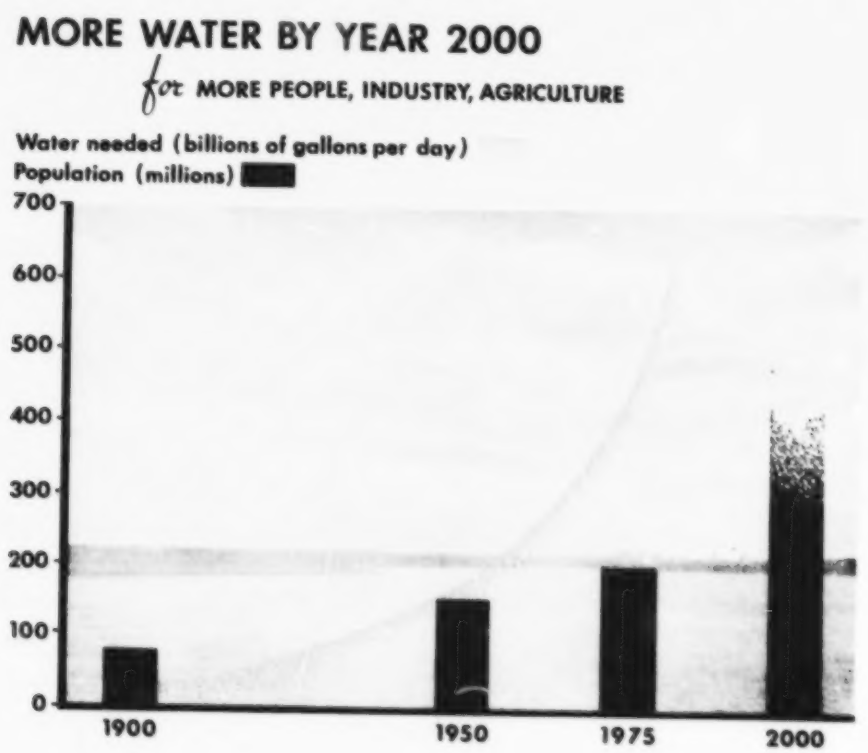
In almost identical words, varied only in context of sentence and paragraph, this is how these learned studies summed up the situation.

Water—too much or too little, depending on time and place—is at the root of the valley's evils.

Floods—*too much water*—exact enormous toll of property, land, crops, money and lives. And, while this flood water destructively wastes itself, drought—*too little water*—turns fertile land into dustbowls, kills cattle and crops, dries up wells and waterholes, and forces people to abandon their homes and livelihood.

The Value of Water

Water the answer to all valley difficulties? It sounds too simple. All of us are so familiar with water we



the future

take it for granted, and think we know all about it. But do we know how really essential it is—and will be, for the welfare of Missouri basin residents and the country as a whole?

Water is the most vital ingredient of both agriculture *and* industry. Essential for growing crops and producing livestock, water is equally essential for manufacturing everything from toothpicks to steel.

Absolutely Essential

Water is of course absolutely essential also for domestic and municipal consumption, including its use to remove waste that would otherwise fatally poison our economy.

Here are a few facts about water. Growth of a bushel of wheat requires 30,000 gallons of water, a ton of hay 500,000.

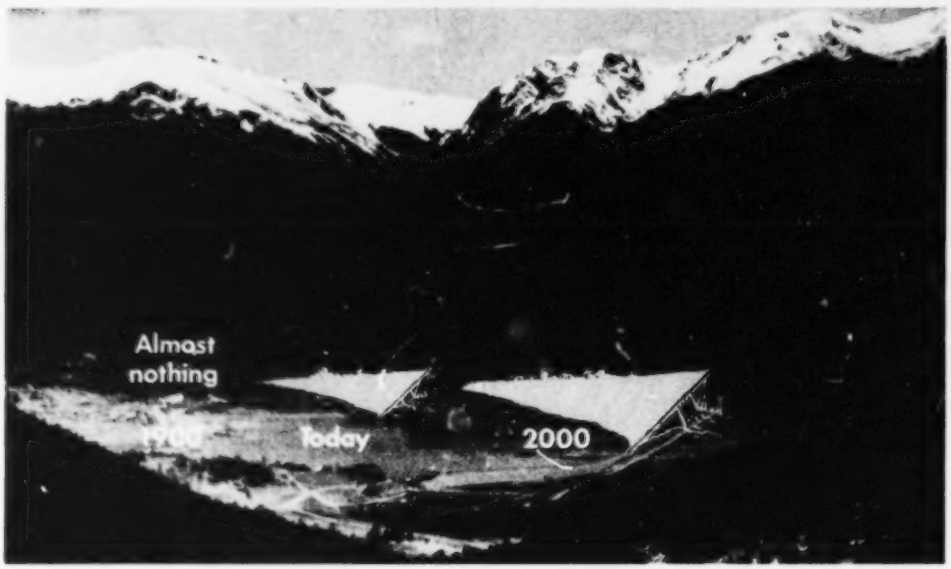
Production of a ton of steel requires 65,000 gallons of water, a ton of paper 39,000 and a barrel of oil 770 gallons.

Two Miles to the Gallon

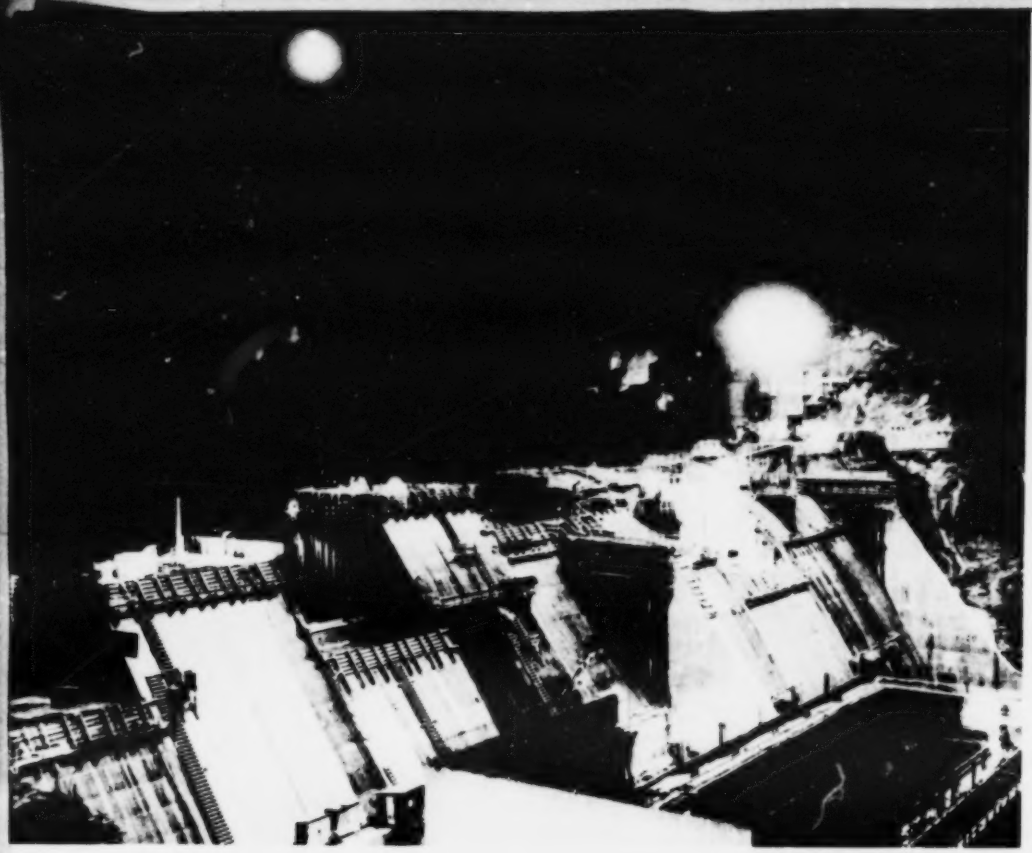
Producing a gallon of gasoline from crude oil requires eight gallons of water. This means that a car averaging 16 miles to a gallon of gas gets only two miles to a gallon of water. United States motor vehicles therefore yearly require 250 billion gallons of water.

Every letter mailed requires a gallon of water; first-class mail is only a fraction of other mail and paper used, which yearly requires a trillion gallons of water in manufacture.

These are only samples of the vital part water plays in our economy. It goes without saying that conservation and use of water is our first line of national defense.



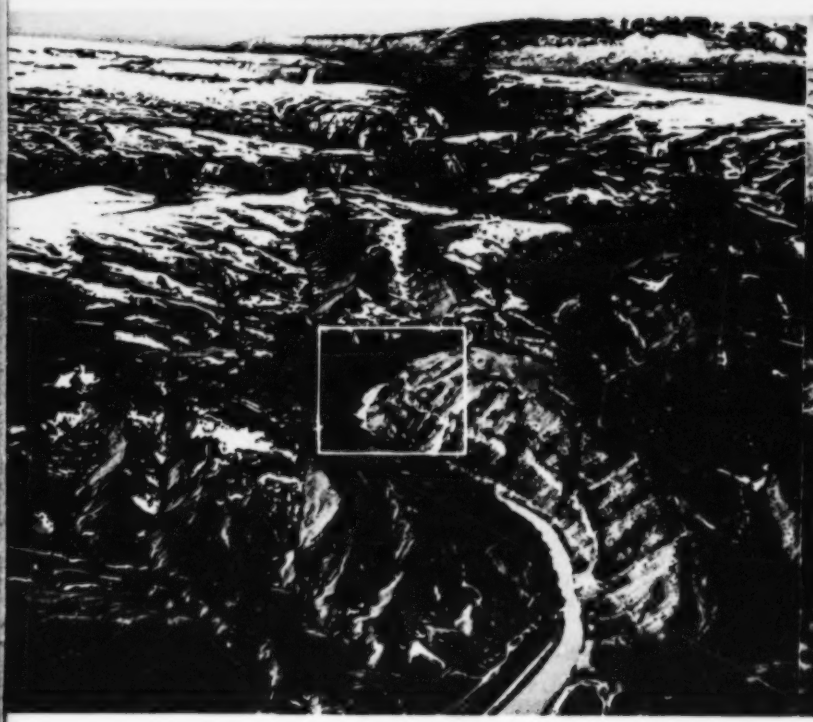
An expanding economy's demand for water in a technological age is almost unlimited . . . solution: Artificial storage of water available for use as needed. Water storage in the Missouri basin, almost nothing in 1900, today totals 60 million acre-feet; goal by year 2,000 is 107 million acre-feet

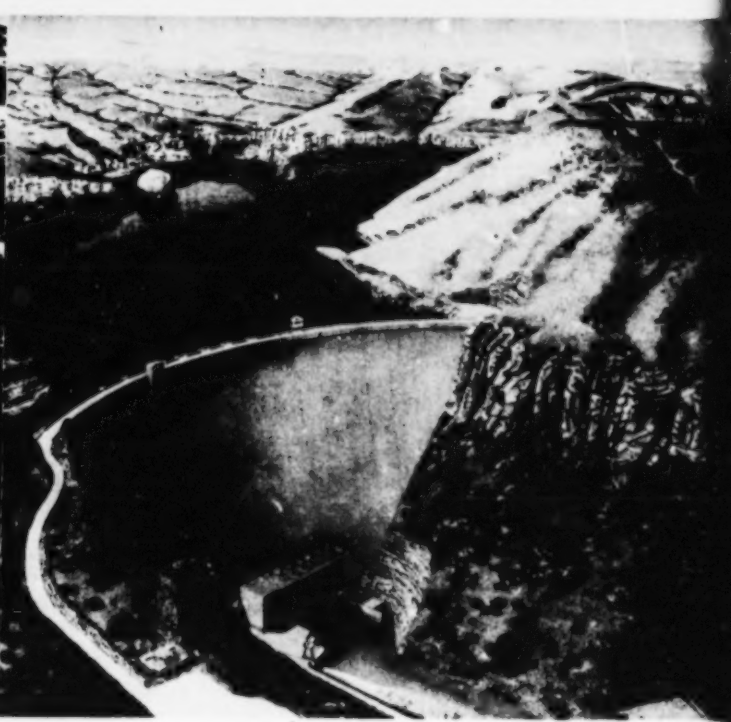


The continuing task

. . . complete work underway

. . . start new projects





This rugged terrain *(above left)* will one day have a dam, as indicated, like the artist's conception superimposed on the actual site *(above right)*

. . . stop pollution

. . . develop wasteland

All this work depends on *men* —our most important resource—
trained for the task

Accomplishments

Twelve years of basin development offer a prologue to total future value. The people; their State governments and their Federal agencies, in 1958 could count these finished jobs and public services:

A system of 27 major dams and reservoirs on the Missouri and its tributaries . . . total storage capacity, 60 million acre-feet of water. Of these, four major reservoirs of the main river are essentially completed, with a water storage capacity of some 49 million acre-feet, twice the river's average annual flow at Sioux City.

New irrigation in operation or nearing completion, totaling 222,717 acres.

Eight hydropower plants at operating dams, producing nearly 5 billion kilowatt hours of electricity annually.

Levees and floodwalls protecting almost a score of cities and towns against destructive floods.

About 250 miles of agricultural levees flanking the lower Missouri River for supplemental flood protection to over 200,000 farmland acres.

A Missouri River navigation and bank stabilization project 85 percent completed from Omaha to the Missouri's mouth; 46 percent completed from Omaha to Sioux City.

A promising new navigation industry on the lower Missouri which has already substantially reduced transportation costs on bulk commodities.

Substantial elimination of the possibility of major destructive floods on the Missouri River down to Kansas City, insured by main stem and tributary reservoirs in combination with local levees and floodwalls.

Assured water supply for future needs of Missouri River cities and towns whose 2 million people depend upon the river's flow.

Soil Conservation Districts practically blanketing the basin with active programs for erosion control, soil conservation and increased soil fertility.

Additional reservoirs under construction which in a few years will add their beneficial services to those of the reservoirs now functioning.

A vast potential, in connection with reservoirs, for recreation in a region long deprived of large and attractive bodies of clear water. Already the Missouri basin reservoirs are attracting an estimated 4 million people annually for family enjoyment and relaxation.

The Task Ahead

The pattern of cooperative agency action and public support, which has made possible past progress on the basin's development plan, is a good omen for the future.

Many more reservoirs have to be built before the basin's limited water supply can be fully conserved and converted to useful purposes, with its flood threat eliminated.

Several of the Nation's largest irrigation undertakings, running into millions of acres of land, are yet to be developed.

Many towns and cities and hundreds of thousands of acres of agricultural lands still are subject to flood ravages and need the protection of planned or authorized reservoirs, levees, and channel improvements.

The main river below Kansas City, although partially protected by upstream reservoirs, will remain subject to flood hazards until such major tributaries as the Kansas, Osage, and Grand Rivers are controlled by planned or authorized works.

Additional needed power facilities are part of the future program for the main river and tributary streams.

The channel control project on the river below Sioux City needs to be carried to completion to protect agricultural lands, encourage navigation and supplement low flow regulation by reservoirs.

Land treatment, watershed protection, pollution-abating waste treatment plants, and other measures also are part of the construction planned for the next decade of progress in the Missouri basin.

All this will require energetic effort, coordination, teamwork and public understanding. The pattern of past success based on unity and mutual cooperation is a guidepost of promise for the future.

SUMMARY

In capsule form, primary objectives of the development plan are:

More than 100 large multipurpose dams capable of storing well over a year's riverflow; nearly ½ million little check dams to conserve water as it falls, aiding flood control and conserving soil.

Soil (and water) conservation on more than 300 million acres of farms, rangeland and forest.

Water for irrigating 4 million acres of land, creating 100,000 new stable incomes, based on a $250 million annual output of food, feed and fiber, and establishing a $½ billion annual market for manufactured goods; in time creating many new communities, and livelihood for 2 million people.

New electric generating capacity—over 2½ million kilowatts— enough for the light and power needs of 3½ million people.

Eight hundred miles of levees, bank and channel stabilization to protect river cities and 1½ million acres of river farmland, and establish an inland waterway for bulk goods such as grain, ore, oil, coal, steel.

Regulation of riverflow to create and maintain city and factory water supply, and reduce pollution.

Public recreation facilities at reservoirs, along the river and in forests: fishing, boating, hunting; wildlife refuges.

Total cost of the cooperative plan of development amounts to only four times the amount of public assistance to the basin in the 1930's—ten times the damage caused by a single major flood in 1951. Progress of work in the great Missouri valley has depended and will continue to depend on funds made available.

Partial control will not eliminate floods—half use will not produce the full measure of benefits enabling the basin to make its full contribution to a strong Nation. In controlling the Missouri and putting its water to full use, the cooperative development in progress since 1945 will be successful only to the degree it is consummated.

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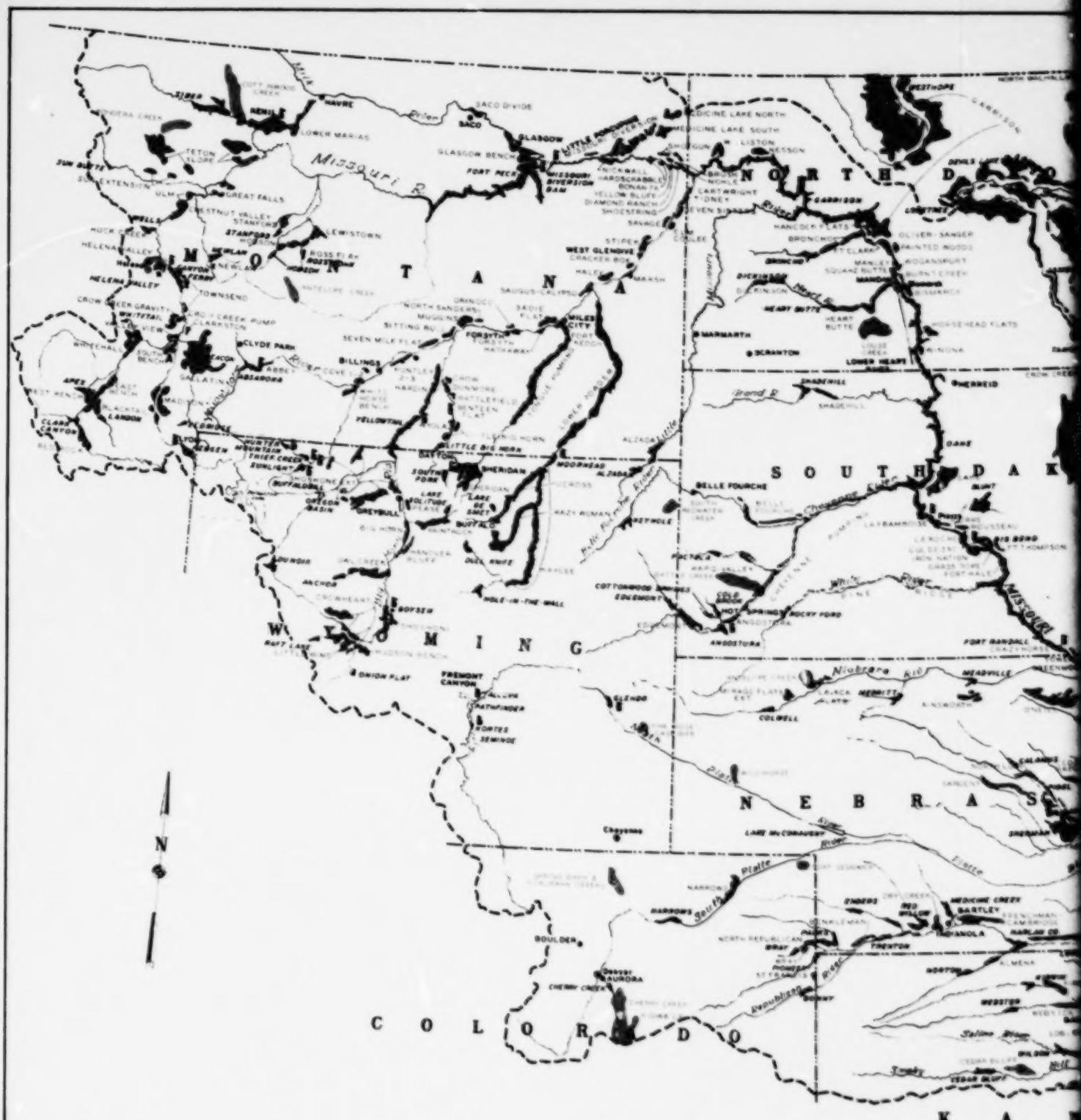

THIS MAP SHOWS THE ACTIVE PARTS OF THE PROGRAM OF DEVELOPMENT FOR THE MISSOURI BASIN. EXCLUDED ARE INACTIVE UNITS, SOME OLDER PROJECTS AND TRANSMISSION LINES.

MISSOURI RIVER BASIN
WATER AND LAND RESOURCES DEVELOPMENT

1958

LEGEND
RESERVOIR
IRRIGATION
FLOOD CONTROL
NAVIGATION
WATERSHED TREATMENT
POWER
SCALE IN MILES
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
IOWA
KANSAS
MISSOURI
MISSISSIPPI
MISSOURI RIVER BASIN
LAND RESOURCES DEVELOPMENT PROGRAM
1958